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*Jurnal Nukleus Peternakan (Juni 2014), Volume 1, No. 1: 81 - 85* *ISSN : 2355-9942*

# QUALITY COMPARISON OF NORMAL AND *PSE* (PALE, SOFT, AND EXUDATIVE) MEAT PORK OF LANDRACE PIG

(Perbandingan daging normal dan daging PSE dari Babi Landrace)

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## ABSTRACT

The quality of normal and PSE meat pork of Landrace pigs have been compared in this research. Forty commercial Landrace pigs were used in the study. Twenty pigs produce normal and the other twenty produce PSE meat. Meat pork samples were taken from eye-muscle *(musculus longisimus dorsi)* which located behind the last rib. Variables measured as meat pork quality indicators were pH, meat colors, and water holding capacity. The results showed that quality of normal meat pork was higher than that of PSE meat pork for all variables. Muscle pH of PSE meat pork rapidly falling in first three hours after slaughtering with pH in 45 minutes, 1 hour, 2 hours, and 3 hours were 5.78, 5.75, and 5.68, respectively; while pH of normal meat pork for the same measurements were 6.57, 6.48, and 6.30 respectively. Muscle of PSE meat was brighter that of normal meat. It was indicated by higher L*and b* coordinate values. The comparison between PSE and normal meat pork for L* & b* were 58.69 vs 53.79 and 17.07 vs 14.80 respectively. Water holding capacity of normal meat pork was higher than that of PSE meat pork.

**Key words**: *PSE (pale,soft,exudative meat pork), meat pork quality, Landrace pig*

## ABSTRAK

Kualitas daging babi normal dan daging PSE babi Landrace telah dibandingkan dalam penelitian ini. Empat puluh babi Landrace komersial digunakan dalam penelitian ini. Dua puluh babi menghasilkan daging normal dan dua puluh menghasilkan daging PSE. Sampel daging babi diambil dari mata-otot (*musculus longisimus dorsi*) yang terletak di belakang tulang rusuk terakhir. Variabel yang diukur sebagai indikator kualitas daging babi adalah pH, warna daging, dan kapasitas menahan air. Hasil penelitian menunjukkan bahwa kualitas daging babi yang normal adalah lebih tinggi dari PSE daging babi untuk semua variabel. pH otot daging babi PSE dengan cepat layu tiga jam pertama setelah disembelih dengan pH di 45 menit, 1 jam, 2 jam, dan 3 jam dengan pH masing-masing 5.78, 5.75, dan 5.68; sedangkan pH daging babi daging normal untuk pengukuran yang sama masing-masing 6.57, 6.48, dan 6.30. Otot daging babi PSE terang dibanding daging babi normal. Hal ini ditunjukkan dengan adanya nilai koordinat L * dan b *. Perbandingan antara L * & b * daging babi PSE dan daging babi normal masing-masing 58,69 vs 53,79 dan 17,07 vs 14,80. Kapasitas menampung air daging babi normal lebih tinggi dari PSE daging babi.

**Kata kunci**: PSE (daging babi pucat, lembut, eksudatif), kualitas daging babi, babi Landrace

## INTRODUCTION

Pig is one kind of livestock in Indonesia functioned to produce meat pork either for domestic consumption or export to abroad. As livestock, pig has some advantages, such as grow faster so it can be sold or slaughtered earlier, more prolific, and its interval-maternity is shorter than that of large ruminant, as well as more efficient in converting feed into meat (Sihombing,1997). However, pigs have also weakness since they can produce *pale, soft and exudative* (PSE) meat pork. Concerning of ability in producing meat pork, hi-breed pig has problem since it produce PSE meat pork which made its performance is not visually attractive to the consumers. It is widely acknowledged that quality of PSE meat pork is lower than that of normal meat pork. Economically, producer, retailer, agro-industry and customer may get loss economically to produce PSE meat pork (Swatland, 1984); Judge *et al*., 1989), Pearson and Young, 1989; Lawrie, 1995). The quality of normal and PSE meat pork of Landrace pigs will be compared in this research.

## MATERIALS AND METHOD

The research was conducted in Laboratory of Animal Production for Large Ruminant, Faculty of Animal Science, Bogor Agricultural Institute. Samples meat was taken from abattoir of Bogor Municipality in three weeks.

### Materials

The research material was 40 pigs of Landrace hi-breed with live body weight 80 – 100 kg, and each 20 pig produce PSE meat pork. The pigs were slaughtered in abattoir of Bogor Municipality. Then, meat pork was taken from one location of muscle, namely *longisimus dorsi* (LD), just behind of the last rib. Equipments used were pH digital meter *Jenwey 3150*, thermometer bimetal, *Warner-Bratzler Shear*, pressing tool for measuring water holding capacity, tissue papers, and cooler box.

### Slaughtering of Pigs

Pigs were brought from farm livestock in Center of Java and took a rest in quarantine stall during one week before slaughtering. In the stall, the animals will be fed and drank every day. Then, they were slaughtered at 1.00 – 04.00 a.m. Before slaughtering, the pigs were weighed, brought out and fainted by striking the pigs' forehead areas, that caused blooding. After that, the slaughtered pigs were processed into carcass and separated into two parts - the left and right sides. Time needed for slaughtering and processed into carcass less than 30 minutes.

### Preparing of meat pork samples

Sample of meat pork were taken in 3 weeks in order to get number of proportionally sample needed. After dividing the carcass, 0.5kg samples were taken of the left carcass. Moreover, measurement of pH in 45 minutes, 1 hour, and two hours were done directly on the field and the samples were kept in cooler box (without ice). The samples, then, were carried to the Laboratory of Large Ruminant, Bogor Agricultural Institute, and continued by measuring the observed variables.

### Variables measurement

(1) Meat pork pH

Measurement of meat pork pH was done by using pH meter portable merk *Jen Way 31150* by putting its electrode into the meat in 90º and ± 2 cm in depth. Times of measurement were 45 minutes, 1 hour, 2 hours, 3 hours, 6 hours, and 12 hours post-mortem.

(2) Meat pork color

Meat pork color was determined by using *Chroma meter* CR-200/CR-210 Minolta to measure levels of meat bright towards coordinate of L* dan b*.

*(3)Water holding capacity meat pork*

Water holding capacity meat pork was measured by applying a method of pressing based on instruction of Hamm cited by Swatland (1984). Amount of water comes out of the meat and absorbed by tissue papers were analyzed using the following formula:

$$mgH_2O = \frac{\text{Wet area } (cm^2)}{0.0948}$$

**Data Analyses**

Quantitative data were analyzed by applying an Analysis of Variance (SAS, 1987).

## RESULT AND DISCUSSION

*Meat pork pH*

Result of the research as showed on Table 1 and pattern of pH declining as performed on Graphic 1 figured that there was a difference in the pattern of pH declining. In the first period of 45 minutes post-mortem, the PSE meat has already reach muscle pH less than 6.2 as a pH of normal meat. Conversely, pH of normal meat was still very high, even in 3 hours post-mortem the muscle pH was still high. In processing of conversing muscle into meat, a changing of pH was very important due to its influence towards other attributes of meat quality. The result was as same as mentioned by Swatland (1984), Judge *et al*. (1989), Pearson and Young (1989) as well as Lawrie (1995) that declining of pH at the beginning hours of post-mortem was very fast characterized the PSE meat, while declining of pH of normal meat was a relatively slow.

Table 1. Average pH of normal and PSE meat

| Time of Waktu Measurement | Kind of meat | | Meaning |
|---|---|---|---|
| | Normal (n = 20) | PSE (n = 20) | |
| pH 45 minutes | 6.57 ± 0.23 | 5.78 ± 0.16 | P< 0.0001 |
| pH 1 hour | 6.48 ± 0.25 | 5.75 ± 0.16 | P< 0.0001 |
| pH 2 hour | 6.30 ± 0.23 | 5.68 ± 0.12 | P< 0.0001 |
| pH 3 hour | 6.29 ± 0.25 | 5.65 ± 0.15 | P< 0.0001 |
| pH 6 hour | 5.64 ± 0.27 | 5.61 ± 0.22 | P< 0.0001 |
| pH 12 hour | 5.42 ± 0.21 | 5.52 ± 0.19 | P< 0.0001 |
| pH 24 hour | 5.31 ± 0.15 | 5.43 ± 0.14 | P< 0.0001 |

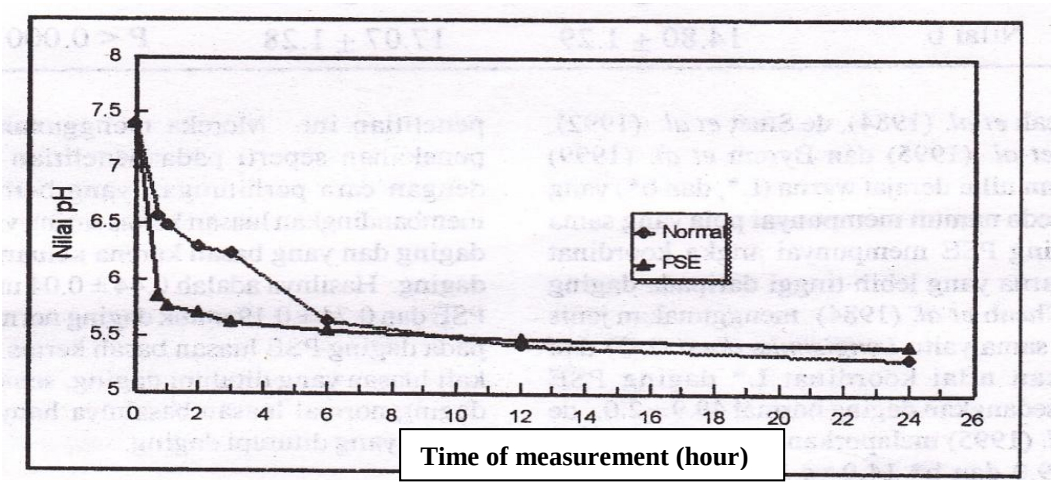


Figure 1. pH declining of normal and PSE meat pork

Cheah *et al* (18984) reported that in muscle of *Longisimus dorsi,* pigs will faint after anaesthetization with a substance called *Halothane* (tend to get stress or PSS) that release of $Ca^{2+}$ *Reticulum sarcoplasma* maximum at first of 45 minutes post-mortem. Concentration of $Ca^{2+}$ in PSS was 5.1 times comparing with normal pork. This condition causes pH at 45 minutes post-mortem tend to be PSS 5.49 ± 0.05; while normal pork was 6.40 ± 0.030. In case of pH of normal pork, van Laack and Smulder (1991b) include Monim *et al*. (1999) also reported that at the beginning trend of pH declining of PSE was very fast. Estrada *et al.* (1991) also stated that pH of PSE pork reached 30 – 75 minutes post-mortem, while last pH of normal pork reached at 4 – 5 hours post-mortem.

*2. Meat Color*

Result showed that PSE pork more pale than normal pork as performed by coordinate number L* dan b* on Chroma Meter on Table 2. L* value was higher means that PSE pork was whiter (brighter); while lower value of L* means that normal pork was darker. On the other hand, value of b* relates to degree of yellow color, means that PSE pork more yellow than that of normal pork. Color of fresh pork was pink greyest describes an attractive performance and consumer preference, however a bright pink color was unattractive.

Swatland (1992) said that in case of PSE, pale color was caused by many lights were reversed back after reaching onto meat or after high lighting made the flash shorter. Then, it effects probability of the meat to absorb light selectively was decrease. The effect was pork PSE becomes paler than normal pork. It was also explained that pink color of pork was formed as a cause of absorbing a part of longer wave, namely green light by *myoglobine*, during the light across the meat. The result of the research supports earlier research that PSE was paler than normal pork.

Table 2. Average Value of L* and b* for Normal and PSE Pork

| Observation | Characteristic of Pork | | Note |
|---|---|---|---|
| | Normal (n = 20) | PSE (n = 20) | |
| Value of L | 53.79 ± 2.57 | 58.69 ± 3.11 | P< 0.0001 |
| Value of b | 14.80 ± 1.29 | 17.07± 1.28 | P< 0.0001 |

Cheah *et al*. (1984), de Smet *et al.* (1992), de Smet *et al*. (1995) dan Byrem *et al*. (1999) reported that degree value of color (L* and b*) a little be different, but they have a same pattern. PSE pork has a higher coordinate number than that of normal pork. Cheah *et al*. (1984) used the same muscle called *Longisimus dors*i (LD) and he reports that coordinate value of L* of PSE was 57.0 ± 2.9; while normal pork was 49.9 ± 2.0. In addition, de Smet *et al*. (1995) explained that coordinate value of L* 55.6 vs 59.0 and b* 14.9 vs 15.1 for normal and PSE pork.

*1. Water Holding Capacity*

Result of measurement performed on Table 3 described that there was a difference in water holding capacity of those two kinds of pork. The PSE pork has a higher value of water holding capacity, means more water came out and absorbed by tissue paper as a cause of pressing. On the other hand, a lower value in normal meat means a smaller amount of water came out as a cause of pressing. Actually, PSE pork releases water about 21.51% of sample weight, while normal pork only 17.12%. In other words, the normal pork has more ability to keep water than that of the PSE pork.

Cheah *et al*. (1984) also described that a low capacity of water holding of PSE pork tend to get stress was similar to this research. Actually, they used same method of pressing but a different method of analyses. Their analyses were by comparing area of tissue

papers covered by the meat and wet as a cause of water came out from the meat. The result was 0.44 ± 0.04 for PSE and 0.74 ± 0.19 for normal meat. It means, in PSE, the width area of the wet tissue papers was 2.27 times the area covered by meat. Conversely, the wet width area was only 1.35 times covered by meat.

## CONCLUSION AND RECOMMENDATION

### Conclusion

It can be concluded that quality of normal meat was higher than that of PSE meat as showed by physical characteristics measured as quality attributes.

### Recommendation

Panel test was necessary to evaluate quality of real consumption of normal and PSE meat in Indonesia.

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